Mechanical Engineering in Ancient Egypt, Part 40: Statues of Jackal, Hippopotamus and Crocodile

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Abstract—The ancient Egyptians produced statues for jackal, hippopotamus and crocodile since 4400 BC and continued in this production down to 30 BC. They produced statues for those animals not only as animals but also as domestic applications such as amulets, boats, spoons, combs, masks, vessels decoration, balance-weight and jar lids. The designs and materials used are investigated with analysis of each item for dimensions, beauty aspects and present location (if known).

Keywords—Mechanical engineering; Ancient Egypt; jackal statues, hippopotamus statues, crocodile statues.

I. INTRODUCTION

This is the 40th paper in a scientific research aiming at presenting a deep insight into the history of mechanical engineering during one of the greatest civilizations in the world, the ancient Egyptians civilization. The paper handles the production of jackal, hippopotamus, crocodile and gazelle during the Predynastic and Dynastic Periods of the ancient Egypt history. The outcome of this presentation shows how the ancient Egyptians appreciated a large number of animals lived among them in Egypt.

Capart (1905) in his book about primitive art in Egypt presented statues for hippopotami [1]. Smith (1960) in his book about ancient Egypt as represented in the Museum of Fine Arts at Boston presented an Amration pottery hippopotamus, a faience hippopotamus [2]. Arnold (1995) in his study on Egyptian bestiary presented a gazelle statue from the 18th Dynasty, a three deken weight in the shape of a gazelle from the 18th Dynasty, a jackal head from the Late Period and a hippopotamus statue from Middle Kingdom [3]. Stevens (2009) in her article in the UCLA Encyclopaedia of Egyptology presented a number of figurines of animals from the Third Intermediate Period [4].

Strandberg (2009) in her Ph. D. Thesis investigated the image and meaning of the gazelle in ancient Egypt art. She presented a gazelle statue from the 18th Dynasty standing on a wooden base representing a desert ground [5]. Brevik (2013) in her Master of Art Thesis presented examples of figurines including a clay figurine for hippopotamus from Naqada II and clay animal figurines from Amrah [6]. Wing (2015) in his Master Thesis in Archaeology presented a number of figurines from the Predynastic era of ancient Egypt including hippopotamus in the form of a vessel and a bead, a clay hippopotamus comb handle, a gazelle knife handle from Naqada II, a hippopotamus amulet from the Badarian Period [7].

Wikipedia (2016) Wrote an article on hunting, fishing and animals in ancient Egypt. They declared that the hippopotamus lived in different parts of ancient Egypt [8]. Hassaan (2017) investigated the evolution of mechanical engineering in ancient Egypt through his study of the statues production of the cats, dogs and lions animals in ancient Egypt. He covered a time span from Predynastic to Late Period and presented a large number of examples analysing most of them showing the innovation in each product[9].
II. JACKAL STATUES

The ancient Egyptians knew the jackal from early times and authorized its existence among them through a number of statues extending from Predynastic to Late Periods as follows:

- The first example is a state jackal statue from Naqada III (3200-3000 BC) in display in the Phoebe A. Hearst Museum of Anthropology, University of California, Berkeley and shown in Fig.1 [10]. The designer showed the jackal striding. One may ask himself: why ancient Egyptians selected the state rock ?. First of all it has low hardness (2.5-4.0 on Moh's scale), produces articles having light weight (2.65-2.80 specific gravity) and it is resistant to weather impact [11]. This shows how ancient Egyptian engineers and technicians were so genius since more than 5000 years.

- The second example is a jackal as a lid for a canopic jar from the 18th Dynasty (1550-1295 BC) in display in the Metropolitan Museum of Art at NY and shown in Fig.2 [12]. The whole canopic jar was produced from limestone and its lid was designed in the shape of a jackal for sake of protection according to their belief.

- The third example is a wooden spoon with jackal handle from the 18th Dynasty (1539-1292 BC) in display in the Brooklyn Museum and shown in Fig.4 [13]. This is a creative mechanical design where the jackal is shown extending its body and holding the spool bowl by its front legs and moth. The handle was carved smoothly not to harm the user.

- The fourth example is a jackal statue from tomb of Pharaoh Tutankhamun (1332-1323 BC) of the 18th Dynasty in display in the Egyptian Museum at Cairo and shown in Fig.4 [14]. The designer showed the jackal in a guarding position and used materials reflecting the wealth of the Pharaoh and the strength of Egypt in this period.
- The fifth example is an alabaster 410 mm head of a jackal as a lid for the canopic jar of Psusennes I, the 3rd Pharaoh of the 21st Dynasty (1047-1041 BC) in display in the Egyptian Museum at Cairo and shown in Fig.5 [15,16]. This is a valuable artefact piece decorated by a Cobra on the head of the jackal and inlaid by gold leaf and another blue and brown strips may be through coating or inlay by semi-precious stones !!. The eyes and eyebrows were marked in black.

- The sixth example is a wooden 515 mm statue from the 25th-26th Dynasties (747-525 BC) in display in the British Museum and shown in Fig.6 [17]. The designer showed the jackal in a guarding position relaxing and concentrating in the area in its front. It is possible that it was constructed from two pieces and joint at the neck together.

- The seventh example is a ceramic jackal mask from the 26th Dynasty (600 BC) in display in the Roemer und Pelizaeus Museum at Hildesheim of Germany and shown in Fig.7 [18]. It has multi levels of brown colour with decorations in the form of parallel curves on the shoulders.

- The eighth example is a limestone canopic jar in the form of a jackal from the Late Period (664-332 BC) in display in the Indianapolis Museum of Art and shown in Fig.8 [19]. The height of the jar is 317.5 mm and the surfaces are rounded and smooth not to harm the user. The quality of the jackal is less than that of Fig.7 in the same period.

Fig.5 Jackal lid from the 21st Dynasty [15,16]. Fig.6 Jackal statue from 25-26 Dynasties [17]. Fig.7 Jackal mask from the 26th Dynasty [18]. Fig.8 Canopic jar from the 26th Dynasty [19].
- The ninth and last example is a limestone recumbent jackal found in Saqqara of Egypt from the Late Period in display in the Metropolitan Museum of Art and shown in Fig.9 [20]. Its design is similar to than in Fig.6 except it was carved from one piece of limestone.

Fig.9 Limestone jackal from the Late Period [20].

### III. HIPPOPOTAMUS STATUES

The ancient Egyptians knew the Hippopotamus since the Badarian Culture (4400-4000 BC) as recorded by beads and vessels in the shape of hippos. This recording of hippos continued to the Late Period of ancient Egypt with concentration of hippo’s production during the Middle Kingdom as will be illustrated in the following examples:

- The first example is an ivory vessel in the shape of a hippopotamus from the Badarian Period (4400-4000 BC) found in the Mostagedda grave 3522 and shown in Fig.10 [21]. This product is more than 6000 years old and has creative mechanical engineering ideas:
  (i) Even though ivory is an easy scratched material, to carve it to produce a cavity of a vessel in the shape of a hippo is not easy and required high degree of profession.
  (ii) If we interpret the view in the left of Fig.10 that there are two openings for the vessel, then this may be the first time in the engineering history to have people using the ventilation principle in the design of vessels.
  (iii) The ancient mechanical engineering designer used the L-shaped elements on the hippo back to help in carrying the vessel.

Fig.10 Ivory vessel from Badarian Period [21].
- The second example is an ivory comb with hippopotamus handle from Naqada I Period of ancient Egypt (3900-3500 BC) in display in the Metropolitan Museum of Art and shown in Fig.11 [22]. Because it was a civilized nation, they used combs to take care of their hair and select proper materials for this purpose not to harm the user. They new how to apply mechanical engineering in such domestic applications. The hippo was carved as an integral part with the comb showing all its details as clear in the zoomed image in Fig.11.

![Ivory comb from Naqada I Period](image1)

Fig.11 Ivory comb from Naqada I Period [22].

- The third example is a clay hippopotamus from Naqada II of ancient Egypt (3500-3200 BC) in display in the Ashmolean Museum at Oxford and shown in Fig.12 [23]. The designer showed the hippo standing and opening its mouth. This artefact was found in a grave. The purpose is not known. It may be for funerary purposes such as protection (as their belief) or it is an storage application with the hippo mouth as the opening.

![Clay hippo from Naqada II Period](image2)

Fig.12 Clay hippo from Naqada II Period [23].

- The fourth example is an alabaster hippopotamus from the Early Dynastic (1\textsuperscript{st} and 2\textsuperscript{nd} Dynasties, 3100-2686 BC) in display in the Metropolitan Museum of Art and shown in Fig.13 [24]. The designer showed this hippo standing in an equilibrium position by adjusting its levels with the ground and closing its mouth and carved from one piece of Egyptian alabaster.

![Alabaster hippo from Early Dynastic](image3)

Fig.13 Alabaster hippo from Early Dynastic [24].

- The fifth example is a hippopotamus statue from the 11\textsuperscript{th} Dynasty of the Medium Kingdom (2130-1991 BC) in display in the Seattle Art Museum at Washington and
shown in Fig.14 [25]. The material and dimensions are not assigned. The hippo is standing and having a decorated cover sheet on his back with marked eyes.

- The sixth example is a 125 mm length faience hippopotamus from the 12th Dynasty (1981-1802 BC) in display in the Metropolitan Museum of Art and shown in Fig.15 [26]. The designer showed the hippo setting on his back legs, opening his mouth and decorated the whole body with geometric shapes.

Fig.14 Hippo from the 11th Dynasty [25]. Fig.15 Faience hippo from the 12th Dynasty [26].

- The seventh example is a faience hippopotamus from the Middle Kingdom (2050-1800 BC) in display in the Saint Louis Art Museum at Missouri and shown in Fig.16 [27]. The designer showed the hippo standing, looking forward and closing its mouth.

- The eighth example is a 203 mm length faience hippopotamus from the Second Intermediate Period (1802-1550 BC) in display in the Risd Museum at Rhode Island, USA and shown in Fig.17 [28]. The designer showed the hippo standing, closing its mouth with head in a lower relative position than that of the hippo of Fig.16. The whole body was decorated by black-painted plant scenes.

Fig.16 Faience hippo from Middle Kingdom [27]. Fig.17 Faience hippo from the 2nd Intermediate Period [28].

- The ninth example is a hematite balance 62.1 gram weight in the form of a hippopotamus head from the 18th Dynasty in display in the Cleveland Museum of Art and shown in Fig.18 [29]. Even though, hematite has a medium hardness, the ancient Egyptian carver could produce a wonderful piece of balance weight having smooth surfaces completely filleted not to harm the user. It is much better in quality that some of the present weight manufactured in some of the Third-World Countries. Great appreciation the mechanical engineering of ancient Egypt.

- The tenth and last example is a 140 mm height alabaster hippopotamus head from the 18th Dynasty, reign of Pharaoh Amenhotep III (1388-1350 BC) in display in the Metropolitan Museum of Art and shown in Fig.19 [30]. The details of the hippo head in this figure are not clear enough for proper analysis. However, the surfaces were
well rounded which was a remarkable feature of most of the ancient Egypt artefacts indicating an excellent engineering tradition.

Fig.18 Hematite weight from the 18th Dynasty [29]. Fig.19 Alabaster hippo head from the 18th Dynasty [30].

IV. CROCODILES STATUES

Crocodiles lived in the River Nile from very old times and the ancient Egyptians traces its life among them and practice its strength and power. Therefore, they authorized its existence through scenes, figurines and statues from as early as the Period of Naqada I (4000-3500 BC). This appreciation continued in almost all the Predynastic and Dynastic Periods as will be illustrated in the following presentations:

- The first example is a clay bowl from Naqada I (4000 BC) in display in the Egyptian Museum at Cairo and shown in Fig.20 [31]. The bowl is decorated by while intersecting line forming inclined patterns and crocodile models set parallel to the inclined patterns. Each crocodile is either formed manually from clay and set in position on the bowl when it is still soft or later on through a proper adhesive.

- The second example is a model of a 99 mm height terracotta boat in the shape of a crocodile from Naqada II (3300 BC) shown in Fig.21 [32]. The location of the boat now is not assigned. This peace of more than 5300 years old has an innovative design simulating the crocodile with head and body streamed not to resist the motion of the boat in the River Nile. The driver with three other objects are in the boat.

Fig.20 Clay bowl from Naqada I [31]. Fig.21 Terracotta model of a boat in the shape of a crocodile from Naqada II [32].
The third example is a 105 mm greywacke spoon with crocodile shaped handle from Early Dynastic Period (3100-2686 BC) found in Tell-el-Farkha of Egypt and shown in Fig.22 [33]. Even though greywacke is one of the hardest stone, the ancient Egyptian could set this complex design and carve it professionally more than 4700 years ago. The presentation way indicates that this unit is outside Egypt.

![Fig.22 Greywacke spoon with a crocodile handle from the Early Dynastic Period [33].](image)

The fourth example is a crocodile statue of undefined materials or dimensions from the 12th Dynasty (1991-1802 BC) in display in the State Museum of Egyptian Art at Munich and shown in Fig.23 [34]. The designer succeeded to show the details of the crocodile skin and head as depicted in the zoomed image of its head.

![Fig.23 Crocodile statue from the 12th Dynasty [34].](image)

The fifth example is a statue of a crocodile shown in the shape of a man found in the temple of Ammenhat III, the 6th King of the 12th Dynasty and in display in the Ashmolean Museum at Oxford and shown in Fig.24 [34]. The material and dimensions are not assigned. However it seems from Fig.24 that it was a colossal statue. It was nicely carved showing its mouth, ears and eyes.

The sixth example is a 94 mm wooden figurine of a crocodile amulet from the 12th/13th Dynasties period (1887-1640 BC) found at El-lahun of Fayyoum in display in the Metropolitan Museum of Art and shown in Fig.25 [35]. The crocodile was shown complete in a sleeping position. The designer succeeded to select the proper type of wood to resist deterioration with time. This unit is more than 3650 years old.

![Fig.24 Crocodile-man statue from the 12th Dynasty [34].](image) ![Fig.25 Crocodile amulet from 12th/13th Dynasties [35].](image)
The seventh example is a granite crocodile statue from the New Kingdom (1570-1069 BC) in display in the Ancient Egypt Museum at Luxor and shown in Fig.26 [36]. The crocodile is one of the difficult animals to model because of its rough skin. Even though the ancient Egyptian carver succeeded to carve it using one of the hardest stones, the granite. The crocodile was shown in this design either standing or striding. The dimensions are not assigned !!.

![Fig.26 Granite crocodile statue from the New Kingdom [36]](image)

The eighth example is a steatite 32 mm length crocodile amulet from the Third Intermediate Period (1070-736 BC) in display in the Walters Art Museum at Baltimore and shown in Fig.27 [37]. Because steatite is relatively a soft stone, the carver could carve easily all the details of the crocodile amulet even its tails set beside it not to take a large space and make the amulet as compact as possible. The designer put a wedge under the head of the crocodile to strengthen this part an avoid giving it the shape of a cantilever with tin tip and avoid harming the user. Great mechanical engineering technology more than 2680 years old.

![Fig.27 Steatite crocodile amulet from the 3rd Intermediate Period [37]](image)

The ninth example is a carnelian 38 mm crocodile amulet from the 21st Dynasty (1077-943 BC) in display in the Metropolitan Museum of Art and shown in Fig.28 [38]. In only 38 mm length, the carver could produce a complete crocodile figurine showing all the external details including its irregular skin as clear in the zoomed image of the crocodile.

![Image of carnelian crocodile amulet](image)
- The tenth example is a crocodile amulet in the shape of a standing man from the 26th-29th Dynasties of the Late Period (664-380 BC) in display in the Metropolitan Museum of Art and shown in Fig.29 [39]. It is manufactured from green faience and the head is of a crocodile with open mouth. Even, the source is saying it is a crocodile head, but I have some doubt this since the crocodile mouth is much thinner than this one. Here come the role of the archaeological experts and the Egyptian government to preserve its heritage against robbery and provide accurate documentation for each artefact.

![Fig.29 Faience crocodile in a man shape from 26th – 29th Dynasties [39].](image)

- The eleventh example is a dark-blue glass crocodile head used as an inlay from the 30th Dynasty-Ptolemaic Period (380-30 BC) in display in the Walters Art Museum at Baltimore and shown in Fig.30 [40]. This is a wonderful piece from glass technology depicting the high technology in ancient Egypt even during its latest dynastic period where it became weak and occupied by Greek and then by Romans. The crocodile head is really marvellous with very smooth rounded surfaces and white marks defining its teeth.

![Fig.30 Dark-blue glass crocodile head [40].](image)

- The twelfth and last example is a 130 mm steatite crocodile from Late Period (664-30 BC) in display in the Liverpool Museum at UK and shown in Fig.31 [41]. The designer showed the crocodile standing or striding and succeeded to show its rough skin

![Fig.31 A steatite crocodile from the Late Period [41].](image)

**CONCLUSIONS**

- The evolution of mechanical engineering in ancient Egypt through the study of the statues industry of jackals, hippopotami and crocodiles during the Predynastic to Late Periods was investigated.
- They started producing jackals since Naqada III down to the Late Period.
- The ancient Egyptians produced jackal figurines and statues in a full-shape or partially as canopic jar lids, spool handle and as a mask.
- They produced jackals using: wood, state, limestone and alabaster materials.
- They used multiple materials in jackal production during the reign of Pharaoh Tutankhamun.
- They produced hippopotamus statues from Badarian Culture up to the time of the 18th Dynasty of the New Kingdom.
- They used: clay, faience, ivory, alabaster and hematite as materials for hippo production.
- The designed hippopotamus statues with closed or open mouth and with external decoration when produced from faience.
- They covered the back of a hippo statue using a decorated cover sheet from the 11th Dynasty.
- Some of the hippo-statues applications were: vessel, comb handle, and a balance weight.
- They started producing crocodile statues since the time of Naqada I and continued down to 30 BC.
- They designed crocodile statues for different purposes such as: external decoration of bowls, boat model, spoon handle, amulets, man with a crocodile head and inlay.
- Materials used in the crocodile production were: clay, wood, terracotta, greywacke, granite, steatite, carnelian, faience and glass.

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BIOGRAPHY

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